

State University of Makassar

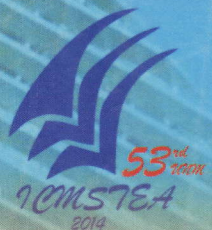
**INTERNATIONAL CONFERENCE ON MATHEMATICS,
SCIENCE, TECHNOLOGY, EDUCATION
AND THEIR APPLICATIONS**

*"Recent Research and Issues on
Mathematics, Science, Technology, Education
and their Applications"*

**PROCEEDINGS
ICMSTE A 2014**

Makassar, August 20-21, 2014

ISBN: 979-604-151-0



ICMSTEA 2014: RECENT RESEARCH AND ISSUES ON MATHEMATICS,
SCIENCE, TECHNOLOGY, EDUCATION AND THEIR
APPLICATIONS

Editorial Board:

Syafruddin Side
Iwan Dini
Rahmat Syam
Sumarlin Mus
Ahmad Fudhail
Andi Irma Suryani
Ansari Saleh Ahmar
Muh. Aqil Rusli
Bustang
Muh. Hijrah
Irwani
Iswan Achlan Setiawan
Nur Wahidin Ashari
Wahyuddin Bara
Zulkifli Rais
Sitti Busyrah Muchsin

Reviewer Board:

Prof. Max Warshauer (Texas State University, USA)
Prof. Susie Groves (Deakin University, Australia)
Prof. Peter Hubber (Deakin University, Australia)
Prof. Naoki Sato (Kyoto University, Japan)
Prof. Baharuddin bin Aris (UTM, Malaysia)
Prof. Ismail bin Kailani (UTM, Malaysia)
Prof. Duangjai Nacapricha (Mahidol University, Thailand)
Prof. Muhammad Arif Tiro (State University of Makassar, Indonesia)
Prof. Suratman Woro Suprodjo (Gadjah Mada University, Indonesia)
Prof. Gufron D. Dirawan (State University of Makassar, Indonesia)
Dr. Frans van Galen (Utrecht University, Netherlands)
Dr. Siti Nuramaliati Prijono (The Indonesian Institute of Sciences)
Oslan Jumadi, Ph.D. (State University of Makassar, Indonesia)
Muhammad Abdy, Ph.D. (State University of Makassar, Indonesia)
Dr. Suarlin (State University of Makassar, Indonesia)
Dr. Ramlawaty (State University of Makassar, Indonesia)

Lattices as Ordered Sets

Fitriani, Bahar, UIN Alauddin Makassar, State University of Makassar

Contemporary Correlation

Sukarna, State University of Makassar

Screening of Tembelekan Plant (*Lantanacamaralinn*) Active Compounds
For prevention of Infectious

✓ *Muharram, Iwan Dini, Pince Salempa, Sitti Faika, Ahmad Fudhail*,
State University of Makassar

Performance of the Diffusive Gradients in Thin Films (DGT) Technique for
Measurement of Labile Cu in Environmental

Khairuddin, Abd Wahid Wahab, Buchari, Indah Raya, Tadulako University,
Hasanuddin University, Bandung Institute of Technology

Cadmium: A Micronutrient for Diatom Marine Phytoplankton

Arifin, M. Sjahrul, Ahyar Ahmad, Indah Raya, Halu Oleo University

Antibiotic Activity Test Cellulolytic Bacteria Isolates CC1 And CC2 of the
Larvae of the Butterflies (*Cossus cossus*)

Maswati Baharuddin, Abd. Rauf Patong, Ahyar Ahmad, Nursiah La nafie,
University of Hasanuddin

Synthesis and Characterization of Coke from Charcoal Obtained from Pyrolysis
of Coconut Shell

Meytij Jeanne Rampe, Vistarani Arini Tiwow, State University of Manado,
State University of Makassar

Isolation and Structure Elucidation of B-Sitosterol Compound from the
N-Hexane Fraction of Root Wood of *Pterospermum Subpeltatum* C.B. Rob

✓ *Pince Salempa*, State University of Makassar

Synthesis of Pesticides Organic of Kirinyuh (*Chromolaena Odonata*) for
Armyworm and Caterpillar Soil Pest on Cabbage and Scallion

Ignatius R.S. Santoso, Henny L. Rampe, Manado State University, Sam
Ratulangi University

Synthesis Molecular Imprinted Polymer Methacrylic Acid (MIP_MAA) Using
Molecular Imprinting

St. Fauziah, Nunuk Hariani, Muh. Bachri Amran, Paulina Taba, Hasanuddin
University, Technology Institute of Bandung

Structure-Activity Relationship for Larvicidal Activity of Non-phenolic
Compounds from the Stem Bark of Red Mangrove (*Rhizophora Stylosa*)

Suyatno, Nurul Hidayati, Surabaya State University

The Influence of Variation in the Amount of Starch Adhesive on the Calorific
Value of Coconut Shell Charcoal

Sudding, State University of Makassar

ISOLATION AND STRUCTURE ELUCIDATION OF β -SITOSTEROL COMPOUND FROM THE N-HEXANE FRACTION OF ROOT WOOD OF PTEROSPERMUM SUBPELTATUM C.B. ROB

Pince Salempa

Department of Chemistry, Faculty of Mathematic and Natural Science,
State University of Makassar, Parang Tambung, Sulawesi Selatan, Indonesia.
e-mail address: pince_salempa@yahoo.com

Abstract

Isolation and structure elucidation of β -sitosterol compound has been performed for the first time from N-hexane extracts of *Pterospermum subpeltatum* C.B. Rob (Sterculiaceae) wood root. The wood powder of *P. subpeltatum* was extracted with methanol, and the methanol extracts was partitioned with N-hexane. N-hexane fraction showed activity against brine shrimp (*Artemiasalina*) with LC50 each of 44,02; 76,68; 396,42; > 500 ppm. The molecular structure of compound is determined based on interpretation of the data of IR spectroscopy, ¹H and ¹³C-NMR.

Keywords: *Pterospermum subpeltatum*, β -sitosterol, *Artemiasalina*.

Introduction

Pterospermum plants including one of the Sterculiaceae family genus and grows in Primary forests or grown locally in secondary forests and especially on the edge of the river on alluvial soils to grow at an altitude of 1400 m above sea level. *Pterospermum* consists of 4 species found in India, Burma (Myanmar), Indo-China, South China, Thailand, and the entire region of Malaysia except Papua New Guinea, as well as on several islands in Indonesia (Boer *et al*, 1996). *Pterospermum* commonly known as *walang* and Sumatra by the name *gongkoras*. In Sulawesi, this plant is found in several areas, among others Production Bantaeng (banjoro), a screen (Muna) (rumbei). *Pterospermum* plants are included in the Sterculiaceae family widely been used as traditional medicine for the people of Sulawesi (Kruit *et al* in Heyne, 1977). *P. javanicum* bark is used to cure fever, toothache, boils, and sprains.

P. diversifolium leaves drug known as itching and root bark of this plant is used as a fish poison (Ogata *et al*, 1995). Camporese *et al* 2003 reported on the antibacterial activity of N-hexane extract and methanol extract of stem bark of *Guazuma ulmifolia* (Sterculiaceae). N-hexane extract can inhibit the growth of *E. coli*, while the methanol extract inhibited the growth of *Pseudomonas aeruginosa*. Reid *et al*. (2005) studied the antibacterial activity of various extracts of *Cola green way* and reported that the ethyl acetate fraction actively inhibit the growth of *Klebsiella pneumoniae* and *Staphylococcus aureus*. Search phylogenetic several plants of Sterculiaceae species, steroid compounds found them stigmasterol glucoside and ethyl acetate extract of *Ambroma augusta* roots (Alam *et al*, 1995). Our literature shows no studies reporting about the bioactivity of compounds of 5 major fraction of N-hexane and compounds β -sitosterol from *Pterospermum subpeltatum* C. B. Rob rootwood. Molecular structure of the compound is determined based on the interpretation of data covering

spectroscopy of IR, NMR (^1H , ^{13}C , HMQC, HMBC and H-H COSY)

The melting point is determined by means of John Fisher, infrared spectra obtained with a Perkin Elmer FTIR spectrophotometer, while ^1H (500 MHz) and ^{13}C (125MHz) NMRJ eol determined with a spectrophotometer.

2. Material and Method

2.1. Material

Plant material used is root wood *Pterospermum subpeltatum* C.B. Rob, obtained from the district Produktion West Sulawesi and has been determined in the Bogor-based, Center for Research and Development Biology, LIPI Bogor.

2.2. Method

The method used is the extraction and isolation. A total of 10kg of dry weight of root wood *Pterospermum subpeltatum* C.B. Rob pulverized and then macerated with methanol for 1x24 hours several times. Macerat obtained is evaporated until a viscous macerat obtained by 3L with 1,047 kg dry weight. The macerat further partitioned with N-hexane solvent. N-hexane fraction (43.53 g) was fractionated by vacuum column chromatography (VCC) with eluent N-hexane, ethyl asetat-in-xane, ethyl acetate, acetone and methanol with increasing polarity which produces five main fractions. The third fraction from the KVC (12.7g) was further separated by press column chromatography (PCC) with the same fluent as above KKV process isolates obtained yellowish white. Furthermore, the crystallization with a solvent of chloroform and methanol to obtain shiny white crystals obtained by weighing 120 mg were then recrystallized with hot methanol yield as much as 79 mg of white crystals (compound X).

Biological test. Toxicity tests performed using fry shrimp *Artemia salina*

in accordance with the method of Meyer *al.*

3. Results and Discussion

Compound X obtained as a powder t.l. 130-131 °C: IR (KBr) 3412, 2956, 2935, 2866, 1664, 1462, 1049,28 cm^{-1} ; ^1H NMR (500 MHz , CDCl_3); and ^{13}C -NMR (125 MHz, CDCl_3) shown in Table 1.

Compound X was obtained as a needle crystal clear, t.l. 130-131 °C. Spectrum IR (KBr) shown absorption at wave number 3412 cm^{-1} , identify presence of free OH, in 2956, 2935, 2866 cm^{-1} for C-H aliphatic, 1664 cm^{-1} group (C=C), 1462 cm^{-1} (CH_2), and 1049,28 cm^{-1} (CH_3) and in 1049,28 cm^{-1} for stretching vibration C-O. Spectrum ^1H -NMR compound (1) showed a signal at δ 1,12; 1,85; 2,27; 2,01; 1,48; 1,98; 1,56; 1,63 ppm each (2H, m) as methylene signal at δ 3,52; 1,48; 0,93; 1,05; and 1,08 ppm each (1H, m) and in 5,34 ppm (1H, t, J=4 Hz) which indicates the presence of methylene. At the δ 0,67 and 1,00 ppm (3H, s, H-18 and H-19) as the methyl group. Free OH group is indicated by the signal δ 5,10 ppm (brs). Proton signals, indicate the presence of the steroid skeleton substituted by two methyl and hydroxyl. In the aliphatic region seen some signals that indicate a unit of aliphatic is 3 signals for a methylene group δ 1,15 (2H, m, H-22), 1,15 and 1,25, methylene at the δ 1,35, 0,91 dan 1,66 (1H, m, H-25) and 4 methyl group at δ 0,92 (3H, d, J=6,7 Hz, H-21), 0,81, 0,85 ppm, ten proton signal is in the framework. Data Analysis spectroscopy ^{13}C -NMR showed 29 carbon signals which represent 29, which includes a carbon on δ 71,9 ppm and 2 carbon alkene δ 140,9 and 121,9. Spectrum of DEPT-135 show positive carbon signals consisting of carbon methyl on δ : (12,0; 12,1; 18,9; 19,1; 21,1; 21,2; 21,3; 21,4; 21,5; 21,6; 21,7; 21,8; 21,9; 22,0; 22,1; 22,2; 22,3; 22,4; 22,5; 22,6; 22,7; 22,8; 22,9; 23,0; 23,1; 23,2; 23,3; 23,4; 23,5; 23,6; 23,7; 23,8; 23,9; 24,0; 24,1; 24,2; 24,3; 24,4; 24,5; 24,6; 24,7; 24,8; 24,9; 25,0; 25,1; 25,2; 25,3; 25,4; 25,5; 25,6; 25,7; 25,8; 25,9; 26,0; 26,1; 26,2; 26,3; 26,4; 26,5; 26,6; 26,7; 26,8; 26,9; 27,0; 27,1; 27,2; 27,3; 27,4; 27,5; 27,6; 27,7; 27,8; 27,9; 28,0; 28,1; 28,2; 28,3; 28,4; 28,5; 28,6; 28,7; 28,8; 28,9; 29,0; 29,1; 29,2; 29,3; 29,4; 29,5; 29,6; 29,7; 29,8; 29,9; 30,0; 30,1; 30,2; 30,3; 30,4; 30,5; 30,6; 30,7; 30,8; 30,9; 31,0; 31,1; 31,2; 31,3; 31,4; 31,5; 31,6; 31,7; 31,8; 31,9; 32,0; 32,1; 32,2; 32,3; 32,4; 32,5; 32,6; 32,7; 32,8; 32,9; 33,0; 33,1; 33,2; 33,3; 33,4; 33,5; 33,6; 33,7; 33,8; 33,9; 34,0; 34,1; 34,2; 34,3; 34,4; 34,5; 34,6; 34,7; 34,8; 34,9; 35,0; 35,1; 35,2; 35,3; 35,4; 35,5; 35,6; 35,7; 35,8; 35,9; 36,0; 36,1; 36,2; 36,3; 36,4; 36,5; 36,6; 36,7; 36,8; 36,9; 37,0; 37,1; 37,2; 37,3; 37,4; 37,5; 37,6; 37,7; 37,8; 37,9; 38,0; 38,1; 38,2; 38,3; 38,4; 38,5; 38,6; 38,7; 38,8; 38,9; 39,0; 39,1; 39,2; 39,3; 39,4; 39,5; 39,6; 39,7; 39,8; 39,9; 40,0; 40,1; 40,2; 40,3; 40,4; 40,5; 40,6; 40,7; 40,8; 40,9; 41,0; 41,1; 41,2; 41,3; 41,4; 41,5; 41,6; 41,7; 41,8; 41,9; 42,0; 42,1; 42,2; 42,3; 42,4; 42,5; 42,6; 42,7; 42,8; 42,9; 43,0; 43,1; 43,2; 43,3; 43,4; 43,5; 43,6; 43,7; 43,8; 43,9; 44,0; 44,1; 44,2; 44,3; 44,4; 44,5; 44,6; 44,7; 44,8; 44,9; 45,0; 45,1; 45,2; 45,3; 45,4; 45,5; 45,6; 45,7; 45,8; 45,9; 46,0; 46,1; 46,2; 46,3; 46,4; 46,5; 46,6; 46,7; 46,8; 46,9; 47,0; 47,1; 47,2; 47,3; 47,4; 47,5; 47,6; 47,7; 47,8; 47,9; 48,0; 48,1; 48,2; 48,3; 48,4; 48,5; 48,6; 48,7; 48,8; 48,9; 49,0; 49,1; 49,2; 49,3; 49,4; 49,5; 49,6; 49,7; 49,8; 49,9; 50,0; 50,1; 50,2; 50,3; 50,4; 50,5; 50,6; 50,7; 50,8; 50,9; 51,0; 51,1; 51,2; 51,3; 51,4; 51,5; 51,6; 51,7; 51,8; 51,9; 52,0; 52,1; 52,2; 52,3; 52,4; 52,5; 52,6; 52,7; 52,8; 52,9; 53,0; 53,1; 53,2; 53,3; 53,4; 53,5; 53,6; 53,7; 53,8; 53,9; 54,0; 54,1; 54,2; 54,3; 54,4; 54,5; 54,6; 54,7; 54,8; 54,9; 55,0; 55,1; 55,2; 55,3; 55,4; 55,5; 55,6; 55,7; 55,8; 55,9; 56,0; 56,1; 56,2; 56,3; 56,4; 56,5; 56,6; 56,7; 56,8; 56,9; 57,0; 57,1; 57,2; 57,3; 57,4; 57,5; 57,6; 57,7; 57,8; 57,9; 58,0; 58,1; 58,2; 58,3; 58,4; 58,5; 58,6; 58,7; 58,8; 58,9; 59,0; 59,1; 59,2; 59,3; 59,4; 59,5; 59,6; 59,7; 59,8; 59,9; 60,0; 60,1; 60,2; 60,3; 60,4; 60,5; 60,6; 60,7; 60,8; 60,9; 61,0; 61,1; 61,2; 61,3; 61,4; 61,5; 61,6; 61,7; 61,8; 61,9; 62,0; 62,1; 62,2; 62,3; 62,4; 62,5; 62,6; 62,7; 62,8; 62,9; 63,0; 63,1; 63,2; 63,3; 63,4; 63,5; 63,6; 63,7; 63,8; 63,9; 64,0; 64,1; 64,2; 64,3; 64,4; 64,5; 64,6; 64,7; 64,8; 64,9; 65,0; 65,1; 65,2; 65,3; 65,4; 65,5; 65,6; 65,7; 65,8; 65,9; 66,0; 66,1; 66,2; 66,3; 66,4; 66,5; 66,6; 66,7; 66,8; 66,9; 67,0; 67,1; 67,2; 67,3; 67,4; 67,5; 67,6; 67,7; 67,8; 67,9; 68,0; 68,1; 68,2; 68,3; 68,4; 68,5; 68,6; 68,7; 68,8; 68,9; 69,0; 69,1; 69,2; 69,3; 69,4; 69,5; 69,6; 69,7; 69,8; 69,9; 70,0; 70,1; 70,2; 70,3; 70,4; 70,5; 70,6; 70,7; 70,8; 70,9; 71,0; 71,1; 71,2; 71,3; 71,4; 71,5; 71,6; 71,7; 71,8; 71,9; 72,0; 72,1; 72,2; 72,3; 72,4; 72,5; 72,6; 72,7; 72,8; 72,9; 73,0; 73,1; 73,2; 73,3; 73,4; 73,5; 73,6; 73,7; 73,8; 73,9; 74,0; 74,1; 74,2; 74,3; 74,4; 74,5; 74,6; 74,7; 74,8; 74,9; 75,0; 75,1; 75,2; 75,3; 75,4; 75,5; 75,6; 75,7; 75,8; 75,9; 76,0; 76,1; 76,2; 76,3; 76,4; 76,5; 76,6; 76,7; 76,8; 76,9; 77,0; 77,1; 77,2; 77,3; 77,4; 77,5; 77,6; 77,7; 77,8; 77,9; 78,0; 78,1; 78,2; 78,3; 78,4; 78,5; 78,6; 78,7; 78,8; 78,9; 79,0; 79,1; 79,2; 79,3; 79,4; 79,5; 79,6; 79,7; 79,8; 79,9; 80,0; 80,1; 80,2; 80,3; 80,4; 80,5; 80,6; 80,7; 80,8; 80,9; 81,0; 81,1; 81,2; 81,3; 81,4; 81,5; 81,6; 81,7; 81,8; 81,9; 82,0; 82,1; 82,2; 82,3; 82,4; 82,5; 82,6; 82,7; 82,8; 82,9; 83,0; 83,1; 83,2; 83,3; 83,4; 83,5; 83,6; 83,7; 83,8; 83,9; 84,0; 84,1; 84,2; 84,3; 84,4; 84,5; 84,6; 84,7; 84,8; 84,9; 85,0; 85,1; 85,2; 85,3; 85,4; 85,5; 85,6; 85,7; 85,8; 85,9; 86,0; 86,1; 86,2; 86,3; 86,4; 86,5; 86,6; 86,7; 86,8; 86,9; 87,0; 87,1; 87,2; 87,3; 87,4; 87,5; 87,6; 87,7; 87,8; 87,9; 88,0; 88,1; 88,2; 88,3; 88,4; 88,5; 88,6; 88,7; 88,8; 88,9; 89,0; 89,1; 89,2; 89,3; 89,4; 89,5; 89,6; 89,7; 89,8; 89,9; 90,0; 90,1; 90,2; 90,3; 90,4; 90,5; 90,6; 90,7; 90,8; 90,9; 91,0; 91,1; 91,2; 91,3; 91,4; 91,5; 91,6; 91,7; 91,8; 91,9; 92,0; 92,1; 92,2; 92,3; 92,4; 92,5; 92,6; 92,7; 92,8; 92,9; 93,0; 93,1; 93,2; 93,3; 93,4; 93,5; 93,6; 93,7; 93,8; 93,9; 94,0; 94,1; 94,2; 94,3; 94,4; 94,5; 94,6; 94,7; 94,8; 94,9; 95,0; 95,1; 95,2; 95,3; 95,4; 95,5; 95,6; 95,7; 95,8; 95,9; 96,0; 96,1; 96,2; 96,3; 96,4; 96,5; 96,6; 96,7; 96,8; 96,9; 97,0; 97,1; 97,2; 97,3; 97,4; 97,5; 97,6; 97,7; 97,8; 97,9; 98,0; 98,1; 98,2; 98,3; 98,4; 98,5; 98,6; 98,7; 98,8; 98,9; 99,0; 99,1; 99,2; 99,3; 99,4; 99,5; 99,6; 99,7; 99,8; 99,9; 100,0; 100,1; 100,2; 100,3; 100,4; 100,5; 100,6; 100,7; 100,8; 100,9; 101,0; 101,1; 101,2; 101,3; 101,4; 101,5; 101,6; 101,7; 101,8; 101,9; 102,0; 102,1; 102,2; 102,3; 102,4; 102,5; 102,6; 102,7; 102,8; 102,9; 103,0; 103,1; 103,2; 103,3; 103,4; 103,5; 103,6; 103,7; 103,8; 103,9; 104,0; 104,1; 104,2; 104,3; 104,4; 104,5; 104,6; 104,7; 104,8; 104,9; 105,0; 105,1; 105,2; 105,3; 105,4; 105,5; 105,6; 105,7; 105,8; 105,9; 106,0; 106,1; 106,2; 106,3; 106,4; 106,5; 106,6; 106,7; 106,8; 106,9; 107,0; 107,1; 107,2; 107,3; 107,4; 107,5; 107,6; 107,7; 107,8; 107,9; 108,0; 108,1; 108,2; 108,3; 108,4; 108,5; 108,6; 108,7; 108,8; 108,9; 109,0; 109,1; 109,2; 109,3; 109,4; 109,5; 109,6; 109,7; 109,8; 109,9; 110,0; 110,1; 110,2; 110,3; 110,4; 110,5; 110,6; 110,7; 110,8; 110,9; 111,0; 111,1; 111,2; 111,3; 111,4; 111,5; 111,6; 111,7; 111,8; 111,9; 112,0; 112,1; 112,2; 112,3; 112,4; 112,5; 112,6; 112,7; 112,8; 112,9; 113,0; 113,1; 113,2; 113,3; 113,4; 113,5; 113,6; 113,7; 113,8; 113,9; 114,0; 114,1; 114,2; 114,3; 114,4; 114,5; 114,6; 114,7; 114,8; 114,9; 115,0; 115,1; 115,2; 115,3; 115,4; 115,5; 115,6; 115,7; 115,8; 115,9; 116,0; 116,1; 116,2; 116,3; 116,4; 116,5; 116,6; 116,7; 116,8; 116,9; 117,0; 117,1; 117,2; 117,3; 117,4; 117,5; 117,6; 117,7; 117,8; 117,9; 118,0; 118,1; 118,2; 118,3; 118,4; 118,5; 118,6; 118,7; 118,8; 118,9; 119,0; 119,1; 119,2; 119,3; 119,4; 119,5; 119,6; 119,7; 119,8; 119,9; 120,0; 120,1; 120,2; 120,3; 120,4; 120,5; 120,6; 120,7; 120,8; 120,9; 121,0; 121,1; 121,2; 121,3; 121,4; 121,5; 121,6; 121,7; 121,8; 121,9; 122,0; 122,1; 122,2; 122,3; 122,4; 122,5; 122,6; 122,7; 122,8; 122,9; 123,0; 123,1; 123,2; 123,3; 123,4; 123,5; 123,6; 123,7; 123,8; 123,9; 124,0; 124,1; 124,2; 124,3; 124,4; 124,5; 124,6; 124,7; 124,8; 124,9; 125,0; 125,1; 125,2; 125,3; 125,4; 125,5; 125,6; 125,7; 125,8; 125,9; 126,0; 126,1; 126,2; 126,3; 126,4; 126,5; 126,6; 126,7; 126,8; 126,9; 127,0; 127,1; 127,2; 127,3; 127,4; 127,5; 127,6; 127,7; 127,8; 127,9; 128,0; 128,1; 128,2; 128,3; 128,4; 128,5; 128,6; 128,7; 128,8; 128,9; 129,0; 129,1; 129,2; 129,3; 129,4; 129,5; 129,6; 129,7; 129,8; 129,9; 130,0; 130,1; 130,2; 130,3; 130,4; 130,5; 130,6; 130,7; 130,8; 130,9; 131,0; 131,1; 131,2; 131,3; 131,4; 131,5; 131,6; 131,7; 131,8; 131,9; 132,0; 132,1; 132,2; 132,3; 132,4; 132,5; 132,6; 132,7; 132,8; 132,9; 133,0; 133,1; 133,2; 133,3; 133,4; 133,5; 133,6; 133,7; 133,8; 133,9; 134,0; 134,1; 134,2; 134,3; 134,4; 134,5; 134,6; 134,7; 134,8; 134,9; 135,0; 135,1; 135,2; 135,3; 135,4; 135,5; 135,6; 135,7; 135,8; 135,9; 136,0; 136,1; 136,2; 136,3; 136,4; 136,5; 136,6; 136,7; 136,8; 136,9; 137,0; 137,1; 137,2; 137,3; 137,4; 137,5; 137,6; 137,7; 137,8; 137,9; 138,0; 138,1; 138,2; 138,3; 138,4; 138,5; 138,6; 138,7; 138,8; 138,9; 139,0; 139,1; 139,2; 139,3; 139,4; 139,5; 139,6; 139,7; 139,8; 139,9; 140,0; 140,1; 140,2; 140,3; 140,4; 140,5; 140,6; 140,7; 140,8; 140,9; 141,0; 141,1; 141,2; 141,3; 141,4; 141,5; 141,6; 141,7; 141,8; 141,9; 142,0; 142,1; 142,2; 142,3; 142,4; 142,5; 142,6; 142,7; 142,8; 142,9; 143,0; 143,1; 143,2; 143,3; 143,4; 143,5; 143,6; 143,7; 143,8; 143,9; 144,0; 144,1; 144,2; 144,3; 144,4; 144,5; 144,6; 144,7; 144,8; 144,9; 145,0; 145,1; 145,2; 145,3; 145,4; 145,5; 145,6; 145,7; 145,8; 145,9; 146,0; 146,1; 146,2; 146,3; 146,4; 146,5; 146,6; 146,7; 146,8; 146,9; 147,0; 147,1; 147,2; 147,3; 147,4; 147,5; 147,6; 147,7; 147,8; 147,9; 148,0; 148,1; 148,2; 148,3; 148,4; 148,5; 148,6; 148,7; 148,8; 148,9; 149,0; 149,1; 149,2; 149,3; 149,4; 149,5; 149,6; 149,7; 149,8; 149,9; 150,0; 150,1; 150,2; 150,3; 150,4; 150,5; 150,6; 150,7; 150,8; 150,9; 151,0; 151,1; 151,2; 151,3; 151,4; 151,5; 151,6; 151,7; 151,8; 151,9; 152,0; 152,1; 152,2; 152,3; 152,4; 152,5; 152,6; 152,7; 152,8; 152,9; 153,0; 153,1; 153,2; 153,3; 153,4; 153,5; 153,6; 153,7; 153,8; 153,9; 154,0; 154,1; 154,2; 154,3; 154,4; 154,5; 154,6; 154,7; 154,8; 154,9; 155,0; 155,1; 155,2; 155,3; 155,4; 155,5; 155,6; 155,7; 155,8; 155,9; 156,0; 156,1; 156,2; 156,3; 156,4; 156,5; 156,6; 156,7; 156,8; 156,9; 157,0; 157,1; 157,2; 157,3; 157,4; 157,5; 157,6; 157,7; 157,8; 157,9; 158,0; 158,1; 158,2; 158,3; 158,4; 158,5; 158,6; 158,7; 158,8; 158,9; 159,0; 159,1; 159,2; 159,3; 159,4; 159,5; 159,6; 159,7; 159,8; 159,9; 160,0; 160,1; 160,2; 160,3; 160,4; 160,5; 160,6; 160,7; 160,8; 160,9; 161,0; 161,1; 161,2; 161,3; 161,4; 161,5; 161,6; 161,7; 161,8; 161,9; 162,0; 162,1; 162,2; 162,3; 162,4; 162,5; 162,6; 162,7; 162,8; 162,9; 163,0; 163,1; 163,2; 163,3; 163,4; 163,5; 163,6; 163,7; 163,8; 163,9; 164,0; 164,1; 164,2; 164,3; 164,4; 164,5; 164,6; 164,7; 164,8; 164,9; 165,0; 165,1; 165,2; 165,3; 165,4; 165,5; 165,6; 165,7; 165,8; 165,9; 166,0; 166,1; 166,2; 166,3; 166,4; 166,5; 166,6; 166,7; 166,8; 166,9; 167,0; 167,1; 167,2; 167,3; 167,4; 167,5; 167,6; 167,7; 167,8; 167,9; 168,0; 168,1; 168,2; 168,3; 168,4; 168,5; 168,6; 168,7; 168,8; 168,9; 169,0; 169,1; 169,2; 169,3; 169,4; 169,5; 169,6; 169,7; 169,8; 169,9; 170,0; 170,1; 170,2; 170,3; 170,4; 170,5; 170,6; 170,7; 170,8; 170,9; 171,0; 171,1; 171,2; 171,3; 171,4; 171,5; 171,6; 171,7; 171,8; 171,9; 172,0; 172,1; 172,2; 172,3; 172,4; 172,5; 172,6; 172,7; 172,8; 172,9; 173,0; 173,1; 173,2; 173,3; 173,4; 173,5; 173,6; 173,7; 173,8; 173,9; 174,0; 174,1; 174,2; 174,3; 174,4; 174,5; 174,6; 174,7; 174,8; 174,9; 175,0; 175,1; 175,2; 175,3; 175,4; 175,5; 175,6; 175,7; 175,8; 175,9; 176,0; 176,1; 176,2; 176,3; 176,4; 176,5; 176,6; 176,7; 176,8; 176,9; 177,0; 177,1; 177,2; 177,3; 177,4; 177,5; 177,6; 177,7; 177,8; 177,9; 178,0; 178,1; 178,2; 178,3; 178,4; 178,5; 178,6; 178,7; 178,8; 178,9; 179,0; 179,1; 179,2; 179,3; 179,4; 179,5; 179,6; 179,7; 179,8; 179,9; 180,0; 180,1; 180,2; 180,3; 180,4; 180,5; 180,6; 180,7; 180,8; 180,9; 181,0; 181,1; 181,2; 181,3; 181,4; 181,5; 181,6; 181,7; 181,8; 181,9; 182,0; 182,1; 182,2; 182,

Table 1. Spectroscopic Data of ¹H-NMR and ¹³C-NMR X Compound

¹ H-NMR δ ppm (H, multiplicity, konstskopling)	¹³ C-NMR δ ppm	HMBC (H → C)	COSY (H → H)	β-Sitosterol (Holland, 1978)
1,84 (2H, m)	37,4	C-4		37,3
1,85 (2H, m)	31,8	C-3, C-10		31,8
3,52 (1H, m)	71,9	-		71,9
5,10 (brs, 3-OH)				
2,27 (2H, m)	42,4	C-5, C-6, C- 3, C-10		42,4
-	140,9	-		140,9
5,34 (1H, t, J=4,9Hz)	121,9	C-4, C-8, C- 10	7	121,8
2,0 (2H, m)	32,09	-		32,0
1,48 (1H, m)	32,06	-		32,0
0,93 (1H, m)	50,3	-	11	50,3
-	36,6	-		36,6
1,49 (2H, m)	21,2	-		21,1
1,98 (2H, m)	39,9	C-14, C-9		39,9
-	42,4	-		42,4
1,05 (1H, m)	56,9	-		56,8
1,56 (2H, m)	24,4	-		24,3
1,63 (2H, m)	28,4	-		28,2
1,08 (1H, m)	56,2	-		56,2
1,57 (3H, s)	12,0	-		11,9
1,0 (3H, s)	19,5	C-5, C-9, C- 10		19,8
1,35 (1H, m)	36,3	-		36,2
1,92 (3H, d, J=6,7 Hz)	18,9	-		18,8
1,06 (2H, m)	34,0	C-21		34,0
1,05 (1H, m)	29,3	-	24	29,3
1,05 (1H, m)	45,9	-		50,3
1,05 (1H, m)	26,2	C-29	27	26,2

Position	¹ H-NMR δ ppm (H, multiplicity, konstkopling)	¹³ C-NMR δ ppm	HMBC (H → C)	COSY (H → H)	β-Sitosterol (H → H)
26	0,81 (3H, m)	19,1	-	(m, H ₂ -C-18, 19, 20)	(m, H ₂ -C-18, 19, 20)
27	0,83 (3H, m)	20,0	C-28	(m, H ₂ -C-23, 24, 25)	(m, H ₂ -C-23, 24, 25)
28	1,25 (2H, m)	23,2	-	(m, H ₂ -C-23, 24, 25)	(m, H ₂ -C-23, 24, 25)
29	0,85 (3H, m)	12,1	-	(m, H ₂ -C-18, 19, 20)	(m, H ₂ -C-18, 19, 20)

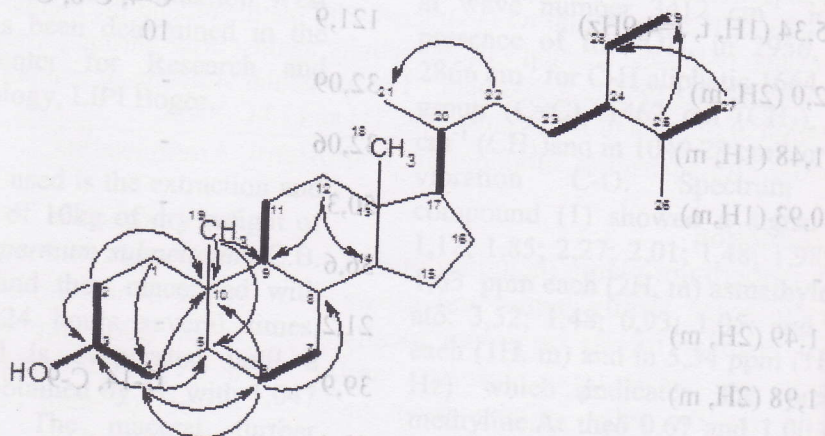


Figure 1.

19,5; and 20,0 ppm), 9 carbon methylen on δ: (71,9; 121,9; 32,06; 50,3; 56,9; 56,2; 36,3; 45,9 and 26,2 ppm). This Spectrum of DEPT carbon also shows the negative signal of the methylene carbon 11δ : 37,4; 31,8; 42,4; 32,09; 21,2; 39,9; 24,4; 28,4; 34,0; 29,3 and 23,2 ppm. From these data it can be seen the presence of quaternary carbon are: δ: 140,9; 36,6 and 42,4 ppm. Twenty-nine of the carbon signals from the skeleton of steroids with a double bond at C-5 and C-6 atoms. C-17 of the steroid skeleton bound to the C-20 atom from alkanes unit. From the data correlation of HMBC (Table 1) between (¹H) and (¹³C)

proton, it can be concluded that compound X is β-sitosterol as shown on Figure 1.

The above data were also compared with data from the literature as shown in Table 1 on this comparison is to ensure that the compound X is β-sitosterol. In the test of (LC₅₀) against *A. salina* of the fractions of N-hexane A1-A5 are 40,02, 76,68, 396,42 ppm and >500 ppm non-toxic. This was showed that the N-hexane fraction largely active against *A. Salina*.

Conclusion

β-sitosterol compound isolated from the main fraction A3 with LC₅₀ 76,68 ppm.

Acknowledgements

We thank the staff of Center for Research and Research Center of Chemistry identified material measurement ¹H and ¹³C.

References

1. Achmad, S.A. 2007. *Hayati Dalam P* Kimia. Prosiding Jurusan Kimia U Walikassar.
2. Alam, M.S., Chopra Niva, M. 1995. *Stigmaterol De* *Andromedaugusta*. *P* 1197-1200.
3. Buer, E., Lemmens *Plant Resources of* *Timber trees: Lesser-I* *553*. Bogor Indonesia
4. Camporese, A., Balick R. Esposito, R. G., M Simone, F., Tubaro, A. *of anti-bacterial medi* *Before (Central Ame* *Ethnopharmacology, 8*
5. Cragg, G.M., D.J. 20 *nature, present develop* *prospects. Dalam F* *(Ed). Nature Produ* *Millennium Prospects* *Application. 285-297.*
6. Harborne, J.B. *Fitokimiadan Penuntu* *Menganalisis Tumbuha*

Conclusion

β -sitosterol compound have been isolated from the main fraction of the N- fraction A3 which has a toxicity (LC₅₀) 76,68 ppm.

Acknowledgements

We thank the staff of Bogor-based, Center for Research and Development and Research Center of Chemical Biology LIPI identified materials plant and measurement ¹H and ¹³C-NMR spectrum.

References

- Achmad, S.A. 2007. Keaneka Ragaman Hayati Dalam Pembelajaran Ilmu Kimia. Prosiding Seminar Nasional Jurusan Kimia Universitas Negeri Makassar.
- Alam, M.S., Chopra, N., Ali, M. and Niwa, M. 1995. Oleanen and Stigmasterol Derivatives from *Ambroma augusta*. *Phytochemistry*, 41 (4) 1197-1200.
- Boer, E., Lemmens, R.H.M.J. 1998. Plant Resources of South-East Asia: Timber trees: Lesser-known timbers No. 5 (3). Bogor Indonesia.
- Camporese, A., Balick, M. J. F., Arvigo, R., Esposito, R. G., Marsellino, N., De Simone, F., Tubaro, A., 2003. Screening of anti-bacterial medicinal plants from Belize (Central America). *Journal of Ethnopharmacology*, 87, 103-107.
- Cragg, G.M., D.J. 2002. Drugs from nature, present developments and future prospects. Dalam Rauter, A.P. dkk (Ed), *Nature Products in the New Millennium Prospects and Industrial Application*. 285-297.
- Harborne, J.B. 1984. Metode Fitokimiadan Penuntun Cara Modern Menganalisis Tumbuhan. ITB Bandung.
- Heyne, K. 1987. Tumbuhan Berguna Indonesia III. Badan Litbang Kehutanan, Jakarta.
- Hatano, T., Miyatake, H., Natsume, M., Osakabe, N., Takizawa, T., Ito, H., Yoshida, T. 2002. Proanthocyanidins and related polyphenols from cacao liquor and their antioxidant effects. *Phytochemistry*. 59. 749-758
- Holland, H.L., Diakow, P.R.P., Taylor, G. J., 1978, Can. J. Chem. 56. 3121-3127.
- Manitto. 1981. *Biosintesis of Natural Products*, John Wiley and Son., New York
- Martens, S., and Mithofer, A. 2005. Molecules of Interest Flavones and Flavone Synthesis. *Phytochemistry*. 66. 2399-3407
- Meselhy, M.R. 2003. Constituents from moghat, the Roots of *Glossostemonbruguieri* Deft. *Molecules*. 8. 614-621
- Meyer, B.N., Ferrigny, N.R., Putnam, J.E., Jacobbsen, L.B., Nicols, D.E., Mc Laughlin, J.L. 1982. Brine Shrimp, A Convenient General Bioassay for Active Plant Constituent. *Medical Plant Research*. 45. 31-34
- Ogata, Y.(Committe Members). 1995. *Indeks Tumbuh-tumbuhan Obat di Indonesia*. PT. Esai Indonesia. Edisi II
- Reid, K. A. Jager, A. K., Light, M. E., Mulholland, D. A., Van Standen, J. 2005. Phytochemical and pharmacological screening of sterculiaceae species and isolation and antibacterial compounds. *Journal of Ethnopharmacology*, 97, 285-291.
- Rocha, J.C.B., Pedrochi, F., Hernandes, L., Mello, J.C.P., Baesso, M.L. 2007. Ex vivo evaluation the percutaneous penetration of proanthocyanidin extracts from *Guazuma ulmifolia* using

photoacoustic spectroscopy. *Analytica Chimica Acta*. **587**. 132-136.

17. Soekarno, N.H., Achmad, S.A., Ghisalberti, Aimi, N., Hakim, E.H., dan Syah, Y.M. 2003b. Artoindonesianin X dan Y, two new Isoprenilated 2-arilbenzophurans, from *Artocarpus freessi* Hassk. *Phytochemistry*. **64**. 831-834.
18. Segawa, P.S., Kasenene, J.M. 2007. Medicinal plant diversity and uses in the Sango by area Southern Uganda. *Ethnopharmacologi*. **113** 521-540.
19. Shrestha, P.M., Dhillion, S.S. 2003. Tradisional medicinal plant use and diversity in the highlands of Dolakha District Nepal. *Ethnopharmacologi*. **86**. 81-89.

- ultrasonic spectroscopy.
Analytica Chimica Acta. **587**. 132-136.
- Wakarmo, N.H., Achmad, S.A.,
Ghisalberti., Aimi, N., Hakim, E.H., dan
Yah, Y.M. 2003b. Artoindonesianin X
and Y, two new Isoprenilated 2-
benzophurans, from *Artocarpus*
hasskii Hassk. *Phytochemistry*. **64**. 831-
841.
- Wagawa, P.S., Kasenene, J.M. 2007.
Medicinal plant diversity and uses in the
area by Southern Uganda.
Ethnopharmacology. **113** 521-540
- Wagtha, P.M., Dhillon, S.S. 2003.
Medicinal plant use and
diversity in the highlands of Dolakha
District Nepal. *Ethnopharmacology*. **86**.
1-39.